station transmitter for a vocoder frame. Next, in step **1150**, the system determines the location of the mobile station being positioned based on the timing measurements made in step **1140**. More particularly, the system identifies one or more intersections between hyperbolic lines of position defined by the timing measurements made in step **1140**. If the system finds more than one such intersection, the exact position of the mobile station may be resolved by using a sector antenna at one of the base stations to select the intersection that represents the true position of the mobile station in the cellular system. The position calculation performed in step **1150** may be made either in the mobile station being positioned or in a base station. Moreover, a map matching table may be used as described above to enhance the accuracy of the mobile position determination made in step **1150**. After the position of the mobile station is determined in step **1150**, transmissions are resumed from the first base station to mobile stations within the coverage area of the first base station.

The process shown in FIG. **11** is preferably repeated periodically in order to maintain current position information on a mobile station as it moves within the cellular system. The process may be repeated, for example, at a time interval equivalent to one out of every 100 voice frames in the signal transmitted by the first base station, or alternatively, every one to three seconds. In addition, the time periods at which neighboring base stations cease transmissions in step **1130** are preferably gated such that adjacent base stations do not cease transmissions simultaneously. Finally, although system **1100** as described above is preferably implemented as part of a spread spectrum or CDMA cellular system, it will be understood by those skilled in the art that the steps of these systems may be implemented in connection with other modulation systems such as, for example, time division multiple access modulation systems, in order to determine the position of mobile stations operating within such systems.

Referring now to FIG. **12**, there is shown the operation of a mobile radio positioning system **1200** where the power of a mobile station is temporarily increased for a frame in order to allow timing measurements to made between the mobile radio and neighboring base stations, in accordance with a preferred embodiment of the present invention. System **1200** begins at step **1210**, when a first CDMA base station is in normal voice communication at a low power level with a CDMA mobile station in the coverage area of the first base station. Next, in step **1220**, while the first base station continues to transmit to mobile stations within its coverage area, a mobile station being positioned attempts to locate itself using trilateration, i.e, by attempting to measure signal arrival time differences between the first base station and two other neighboring base stations. Step **1220** is substantially the same as step **1120** described in connection with FIG. **11** above. In the event such positioning is unsuccessful, processing proceeds to step **1230**, where the CDMA mobile station being positioned increases its transmission power level to a maximum level for a single frame. In step **1240**, while the mobile station's transmitter is at maximum power, at least three neighboring base stations measure arrival time differences of the signal transmitted from the mobile station at maximum power. In addition, in step **1260**, while the mobile station's transmitter is at maximum power, other mobile stations operating at low power within the same cell as the mobile station being positioned mask any errors caused by the temporary increase in transmission power at the mobile station being positioned. Next, in step **1250**, the system determines the location of the mobile station being positioned based on the timing measurements made in step **1240**. More particularly, the system identifies one or more intersections between hyperbolic lines of position defined by the timing measurements made in step **1240**. If the system finds more than one such intersection, the exact position of the mobile station may be resolved by using a sector antenna at one of the base stations to select the intersection that represents the true position of the mobile station in the cellular system. The position calculation performed in step **1250** may be made either in the mobile station being positioned or in a base station. Moreover, a map matching table may be used as described above to enhance the accuracy of the mobile position determination made in step **1250**. After the position of the mobile station is determined in step **1250**, transmissions are resumed at low power from the mobile station being positioned.

The process shown in FIG. **12** is preferably repeated periodically in order to maintain current position information on a mobile station as it moves within the cellular system. The process may be repeated, for example, at a time interval equivalent to one out of every 100 voice frames in the signal transmitted by the mobile station being positioned, or alternatively, every one to three seconds. In addition, although system **1200** as described above is preferably implemented as part of a spread spectrum or CDMA cellular system, it will be understood by those skilled in the art that the steps of these systems may be implemented in connection with other modulation systems such as, for example, time division multiple access modulation systems, in order to determine the position of mobile stations operating within such systems.

Furthermore, it is to be understood that although the present invention has been described with reference to a preferred embodiment, various modifications, known to those skilled in the art, may be made to the structures and process steps presented herein without departing from the invention as recited in the several claims appended hereto.

What is claimed is:

1. A method for determining the position of a mobile station within a cellular telephone system, said cellular telephone system having a base station with first, second and third antennas, comprising the steps of:

(A) transmitting a first signal having a first preassigned Walsh code from said first antenna of said base station to said mobile station, transmitting a second signal having a second preassigned Walsh code from said second antenna of said base station to said mobile station, and transmitting a third signal having a third preassigned Walsh code from said third antenna of said base station to said mobile station, each of said first, second and third signals being modulated with a common spreading code, in addition to the first, second and third Walsh codes;

(B) receiving said first, second and third signals at said mobile station at first, second and third relative receptions times, respectively;

(C) determining first and second positional measurements in accordance with said first, second and third relative reception times; and

(D) determining said position of said mobile station in accordance with said first and second positional measurements.

2. The method of claim **1**, wherein said second and third antennas are each within 300 feet of said first antenna.

3. The method of claim **1**, wherein said first, second and third signals are all transmitted in step (A) on a common RF channel.